

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) For use in ~~In~~ an Internet, a public mobile access data network providing a mobile node data access to the Internet and data access to the mobile node from the Internet when a point of attachment of the mobile node to the public mobile access data network changes, comprising:

~~a home agent mobility manager node coupled to a backbone of the Internet;~~
~~a plural home agent mobility tunnel server servers, coupled to the a backbone of~~
~~the Internet, and forming a virtual home agent network for the mobile node; and~~
~~plural foreign agents, coupled to the home agent router mobility tunnel servers, for~~
~~communicating with one or more mobile nodes over a radio interface,~~

wherein the home agent mobility manager coupled to the backbone of the Internet is configured to establish a data tunnels tunnel between one of the home agent mobility tunnel servers and one of the foreign agents to communicate data with the one of the mobile nodes node.

2. (Original) The public mobile access data network of claim 1, wherein the public mobile access data network provides a public mobility service to locate current locations of mobile nodes so that the Internet is aware of a current point of attachment of one or more mobile nodes to the public mobile access data network.

Jan E. FORSLÖW
Appl. No. 09/484,426
February 2, 2004

3. (Original) The public mobile access data network of claim 2, wherein the public mobility service is provided independently of mobility services offered by a radio access technology specific network.

4. (Original) The public mobile access data network of claim 3, wherein the radio access technology specific network includes GSM/GPRS.

5. (Original) The public mobile access data network of claim 3, wherein the radio access technology specific network includes D-AMPS.

6. (Original) The public mobile access data network of claim 1, wherein the public mobile access data network is operated by an Internet service provider (ISP).

7. (Original) The public mobile access data network of claim 1, wherein the public mobile access data network provides data communication between a corresponding node by way of the Internet with a mobile node.

8. (Original) The public mobile access data network of claim 1, further comprising:

a home agent router coupled to a backbone of the Internet;

plural foreign agent routers coupled to the home agent router for communicating with one or more of the mobile nodes,

wherein a data tunnel is established between the home agent router and one of the foreign agent routers to communicate data with one or more of the mobile nodes.

9. (Original) The public mobile access data network of claim 8, wherein the home agent router is located at a point of presence near the Internet backbone.

10. (Original) The public mobile access data network of claim 8, wherein one or more of the foreign agent routers is located at a local point of presence near a radio access point where the mobile node attaches to the public mobile access data network.

11. (Original) The public mobile access data network of claim 10, wherein the mobile node de-attaches from the public mobile access data network at one of the foreign agents and re-attaches to the public mobile access data network at another one of the foreign agents.

12. (Currently Amended) The public mobile access data network of claim 1, In an Internet, a public mobile access data network providing a mobile node data access to the Internet and data access to the mobile node from the Internet when a point of attachment of the mobile node to the public mobile access data network changes, comprising:

~~a home agent router coupled to a backbone of the Internet;~~

~~plural foreign agent routers coupled to the home agent router for communicating with one or more of the mobile nodes,~~

wherein the home agent router and one of the foreign agents are co-located.

13. (Currently Amended) The public mobile access data network of claim 1, In an Internet, a public mobile access data network providing a mobile node data access to the Internet and data access to the mobile node from the Internet when a point of attachment of the mobile node to the public mobile access data network changes, comprising:

~~a home agent router coupled to a backbone of the Internet:~~

~~plural foreign agent routers coupled to the home agent router for communicating with one or more of the mobile nodes,~~

~~plural home agent routers configured as a virtual home agent network for one of the mobile nodes,~~

~~wherein one of the foreign agent routers serving the mobile node is configured to send~~ sends registration messages to all home agent routers in the virtual home agent network.

14. (Previously Presented) The public mobile access data network of claim 13, wherein reciprocal control signaling between the home and foreign agents is reduced when the home and foreign agents are co-located.

15. (Canceled).

16. (Currently Amended) The public mobile access data network of claim 15, wherein if one of the home agents in the virtual home agent network is dysfunctional, another of the home agents in the virtual home agent network forwards data to and from the mobile node.

17. (Currently Amended) The public mobile access data network of claim 15, wherein one of the home agents in the virtual home agent network closest to a corresponding node sending data to the mobile node via the Internet is selected to forward data to and from the mobile node.

18. (Original) The public mobile access data network of claim 17, wherein the closest home agent has a smallest routing metric relative to the corresponding node.

19. (Currently Amended) The public mobile access data network of claim 15,
wherein one of the home agents in the virtual home agent network is co-located with a foreign agent router near a private data access network.

20. (Currently Amended) ~~The public mobile access data network of claim 15~~
a home agent router coupled to a backbone of the Internet,
a plural foreign agent routers coupled to the home agent router for communicating
with one or more of the mobile nodes,
wherein any one of the home agents in the virtual home agent network may
forward data to and from the mobile node, and
wherein one of the home agents ~~uses~~ is configured to use a multi-exit discriminator parameter to advertise to the Internet a preferred entry ~~point~~ point to the public mobile access data network.

21. (Canceled).

22. (Canceled).

23. (Currently Amended) For use in ~~In~~ an Internet, a public mobile access data network providing a mobile node data access to the Internet and data access to the mobile node from the Internet when a point of attachment of the mobile node to the public mobile access data network changes, comprising:

a home agent router coupled to a backbone of the Internet;

a plural foreign agent routers coupled to the home agent router for communicating with one or more of the mobile nodes,

wherein the home agent and foreign agent routers communicate using a mobile internet protocol and the tunnel includes a label switched path that uses multi-protocol label switching, and

wherein as the mobile node moves from one foreign agent to another foreign agent, the home agent is configured to inject an address associated with the mobile node into the label switched path.

24. (Original) The public mobile access data network of claim 15, wherein one or more tunnels are established between ones of the plural home agent routers and ones of the plural foreign agent routers such that a mobile node communicating over one of the tunnels associated with a first foreign agent continues that communication over another of the tunnels associated with a second foreign agent.

25. (Original) The public mobile access data network of claim 24, wherein the first and second tunnels are established to be relatively static to handle different communications with different mobile nodes.

26. (Original) The public mobile access data network of claim 25, wherein a care-of address of the mobile node associated with the first foreign agent is changed when the communication is continued over the other tunnel associated with the second foreign agent.

27. (Currently Amended) The public mobile access data network of claim 23, In
~~an Internet, a public mobile access data network providing a mobile node data access to~~
~~the Internet and data access to the mobile node from the Internet when a point of~~
~~attachment of the mobile node to the public mobile access data network changes,~~
~~comprising:~~

*B1
Cmx*
~~a home agent router coupled to a backbone of the Internet;~~
~~plural foreign agent routers coupled to the home agent router for communicating~~
~~with one or more of the mobile nodes,~~

~~wherein the home agent and foreign agent routers communicate using a mobile~~
~~internet protocol and the tunnel includes a label switched path that uses multi protocol~~
~~label switching, and~~

wherein the data tunnel is dynamically established using one or more variable service parameters.

28. (Original) The public mobile access data network of claim 27, wherein the one or more variable service parameters used to configure the data tunnel include one or more of the following: quality of service, bandwidth, primary and secondary paths, and a certain type of traffic limitation.

29. (Currently Amended) A method comprising:

configuring a public mobile access data network to provide public data access between an Internet and a mobile node which is attachable to various points of the public mobile access data network over a radio interface;

providing a home agent coupled to a backbone of the Internet;

providing plural foreign agents coupled to the home agent for communicating with one or more of the mobile nodes;

the home agent assigning the mobile node a home address; and

one the foreign agents assigning the mobile node a care-of address,

wherein the home agent associates the home address and the care-of address; and

setting in one or more hosting foreign agents an address of the home agent.

30. (Original) The method in claim 29, further comprising:

offering in the public mobile access data network a public mobility service to locate current locations of mobile nodes so that the Internet is aware of a current point of attachment of one or more mobile nodes to the public mobile access data network.

31. (Original) The method in claim 30, wherein the public mobility service is provided independently of a mobility service offered by a radio access technology specific network.

32. (Previously Presented) The method in claim 29, further comprising:

establishing a data tunnel between the home agent and one of the foreign agents to communicate data with one or more of the mobile nodes.

33. (Original) The method in claim 32, wherein the home agent is located at a point of presence near the Internet backbone.

34. (Original) The method in claim 32, wherein one or more of the foreign agents is located at a local point of presence near a radio access point where the mobile node attaches to the public mobile access data network.

35. (Currently Amended) The method in claim 32, A method comprising:
~~configuring a public mobile access data network to provide public data access between an Internet and a mobile node which is attachable to various points of the public mobile access data network over a radio interface;~~
~~providing a home agent coupled to a backbone of the Internet; and~~
~~providing plural foreign agents coupled to the home agent for communicating with one or more of the mobile nodes,~~
wherein the home agent and one of the foreign agents are co-located.

36. (Original) The method in claim 35, wherein reciprocal signaling between the home and foreign agents is reduced when the home and foreign agents are co-located.

37. (Currently Amended) A method comprising:
configuring a public mobile access data network to provide public data access between an Internet and a mobile node which is attachable to various points of the public mobile access data network over a radio interface;
providing a multiple home agent agents coupled to a backbone of the Internet;
providing plural foreign agents coupled to the home agent for communicating with one or more of the mobile nodes;

configuring plural home agents as a virtual home agent network for one of the mobile nodes; and

one of the foreign agents serving the mobile node sending registration messages to all home agents in the virtual home agent network.

38. (Currently Amended) The method in claim 37, A method comprising:
~~configuring a public mobile access data network to provide public data access between an Internet and a mobile node which is attachable to various points of the public mobile access data network over a radio interface;~~
~~providing a home agent coupled to a backbone of the Internet;~~
~~providing plural foreign agents coupled to the home agent for communicating with one or more of the mobile nodes; and~~
~~configuring plural home agents as a virtual home agent network for one of the mobile nodes,~~
wherein any one of the home agents in the virtual home agent network may forward data to and from the mobile node.

39. (Currently Amended) The method in claim 38 37, wherein if one of the home agents in the virtual home agent network is dysfunctional, another of the home agents in the virtual home agent network forwards data to and from the mobile node.

40. (Currently Amended) The method in claim 38, further comprising:
A method comprising:

configuring a public mobile access data network to provide public data access between an Internet and a mobile node which is attachable to various points of the public mobile access data network over a radio interface;

providing a home agent coupled to a backbone of the Internet;

providing plural foreign agents coupled to the home agent for communicating with one or more of the mobile nodes; and

configuring plural home agents as a virtual home agent network for one of the mobile nodes,

wherein any one of the home agents in the virtual home agent network may forward data to and from the mobile node, the method further comprising:

one of the home agents using a multi-discriminator parameter to advertise to the Internet a preferred entry point to the public mobile access data network.

41. (Currently Amended) The method in claim 38 37, further comprising:

selecting one of the home agents in the virtual home agent network closest to a corresponding node sending data to the mobile node via the Internet to forward data to and from the mobile node.

42. (Currently Amended) The method in claim 38 37, wherein one of the home agents in the virtual home agent network is co-located with a foreign agent near a private data access network.

43. (Currently Amended) The method in claim 32 37, wherein the home agent and foreign agent routers communicate using a mobile internet protocol (IP) and the tunnel includes a label switched path that uses multi-protocol label switching (MPLS).

44. (Cancelled)

45. (Currently Amended) The method in claim 29 43 further comprising:
(B1) Cont
the home agent establishing the tunnel with the foreign agent using the care-of address using and one or more desired tunnel attributes.

46. (Original) The method in claim 45, wherein the one or more desired tunnel attributes includes a class of service, bandwidth, traffic type, primary and secondary paths, or selective routing.

47. (Currently Amended) The method in claim 29 43, ~~wherein the tunnel is a label switched path and the home agent and foreign agent are label switched routers at the ends of the label switched path.~~

48. (Original) The method in claim 47, wherein the label switched routers encapsulate incoming data packets with a label, remove a label from outgoing data packets, and route data packets by swapping labels at each label switched router along the label switched path.

49. (Original) The method in claim 47, further comprising:
merging label switched paths from plural regional foreign agents toward the home agent.

50. (Original) The method in claim 47, further comprising:

aggregating label switched paths at the home agent for plural regional foreign agents.

51. (Original) The method in claim 47, further comprising:
determining the route of the label switched path corresponding to the tunnel to be something other than the shortest route through the public mobile access data network.

52. (Original) The method in claim 47, further comprising:
determining a primary label switched path and a redundant, secondary label switched path corresponding to the tunnel.

53. (Original) The method in claim 47, further comprising:
selecting one of two or more label switched paths to balance a traffic load in the public mobile data access data network.

54. (Canceled).

55. (Currently Amended) ~~The method in claim 47, further comprising:~~ A method comprising:

configuring a public mobile access data network to provide public data access between an Internet and a mobile node which is attachable to various points of the public mobile access data network over a radio interface;

providing a home agent coupled to a backbone of the Internet;

providing plural foreign agents coupled to the home agent for communicating with one or more of the mobile nodes;

the home agent assigning the mobile node a home address;

one the foreign agents assigning the mobile node a care-of address;
the home agent associating the home address and the care-of address; and
adding a set of mobile node IP addresses to the home agent.

56. (Original) The method in claim 55, further comprising:
forwarding a mobile node registration to plural home agent routing nodes.

57. (Original) The method in claim 32, further comprising:
monitoring parameters relating to at least one of use and performance of the data tunnel.

58. (Currently Amended) For use in ~~In~~ a public mobile access data network
providing a mobile node data access to the Internet and data access to the mobile node from the Internet, a first routing node comprising:
a control entity for establishing a label switched path across the public mobile access data network between the routing node and a second routing node, and
a forwarding entity for processing and routing packets over the tunnel,
wherein the control entity includes a mobile internet protocol (IP) controller interfacing a multi-protocol label switching (MPLS) controller for setting up and controlling the label switched path.

59. (Original) The routing node in claim 58, wherein the first routing node is a home agent and the second routing node is a foreign agent.

60. (Canceled).

61. (Previously Presented) The routing node in claim 58, wherein the routing node is coupled to an authentication serving node to ensure the label switched path communications are authorized.

62. (Original) The routing node in claim 58, wherein mobile IP packets are transferred over an MPLS tunnel.

63. (Cancelled)

64. (Previously Presented) The routing node in claim 58, wherein the first routing node is a home agent and the second routing node is a foreign agent and wherein the mobile IP controller is configured to store a care-of IP address of the foreign agent hosting the mobile node.

65. (Previously Presented) The routing node in claim 58, wherein the first routing node is a foreign agent and the second routing node is a home agent and wherein the mobile IP controller is configured to store an IP address of the home agent for the mobile node.

66. (Previously Presented) The routing node in claim 58, wherein the mobile IP controller is configured to determine the route of the label switched path to be something other than the shortest route.

67. (Previously Presented) The routing node in claim 58, wherein the mobile IP controller is configured to determine a primary label switched path and a redundant, secondary label switched path.

68. (Previously Presented) The routing node in claim 58, wherein the mobile IP controller is configured to select a label switched path to balance a traffic load in the public mobile data access data network.

69. (Previously Presented) The routing node in claim 58, further comprising:
a resource reservation protocol controller coupled to the MPLS controller.

70. (Previously Presented) The routing node in claim 58, wherein the first routing node is a foreign agent, the second routing node is a home agent, and the mobile IP controller is configured to request the MPLS controller to establish a table including the label switched path, an address of the home agent, and an address of the mobile node.

71. (Previously Presented) The routing node in claim 58, wherein the mobile IP controller in the home agent is configured to add one or more mobile node IP addresses to a label switched path having a destination address corresponding to a foreign agent care-of address.

72. (Previously Presented) The routing node in claim 58, wherein the first routing node is a foreign agent, and wherein the mobile IP controller is configured to forward a mobile node registration to plural home agent routing nodes.

73. (Previously Presented) The routing node in claim 58, wherein the first routing node is a foreign agent, and wherein the MPLS controller is configured to establish for a single communication with the mobile node plural label switched paths to plural home agent routing nodes.

74. (Currently Amended) The routing node in claim 58, In a public mobile access data network providing a mobile node data access to the Internet and data access to the mobile node from the Internet, a first routing node comprising:

B1/C1
~~a control entity for establishing a data tunnel across the public mobile access data network between the routing node and a second routing node, and~~
~~a forwarding entity for processing and routing packets over the tunnel,~~
wherein the control entity configures the tunnel using one or more variable service parameters.

75. (Original) The routing node in claim 74, wherein the one or more variable service parameters used to configure the tunnel include the following: quality of service, bandwidth, primary and secondary paths, and a certain type of traffic.